REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 38-41, 43-53, 55-65, and 67-74 are in the case.

I. THE INTERVIEW

At the outset, the undersigned wishes to thank the Examiner (Mr. Lu) for kindly agreeing to conducting a telephone interview in this application. The interview was held on October 15, 2004, and was attended by Mr. Matt Adams, a New Zealand patent attorney representing the applicants, as well as by the undersigned. The courtesies extended by the Examiner were most appreciated. The substance of the interview will be clear from the comments presented below.

II. ANTICIPATION REJECTION

Claims 38-81 stand rejected under 35 U.S.C. §102(e) as allegedly anticipated by U.S. Patent 6,102,466 to Sheehan et al. That rejection is respectfully traversed.

As explained during the interview, the invention of the present application is directed to a method of assessing one or more characteristics of an organ or a part thereof from multiple images of the organ or part thereof. The method comprises the steps of

defining the spatial position of at least two of the images;

forming an initial fit between a reference model of the geometric shape of the organ or part thereof and the images according to reference markers on the images;

displaying to a user a user-selected image of the subject organ or part thereof;

displaying to the user a representation of the initial fit of the reference model by superimposing on the user-selected image a representation of the intersection of the reference model with the plane of the user-selected image;

manually user-defining one or more reference guide points associated with the image displayed to the user, for which the spatial positions have been defined;

converting the guide points to three-dimensional coordinates;

improving the fit of the model by fitting the model to the guide points to form an estimate model for the organ or part; and

assessing the one or more characteristic from the estimate model.

According to the method, the multiple images are preferably acquired in a number of spatial locations, having a lowest or apical slice, a highest or basal slice, one or more middle slices and one or more long axis slices (see, page 4, lines 27 to 30 of the specification). The method as claimed in claim 38 includes the step of defining the spatial position of at least two of these multiple images. These spatial positions could be obtained from an image header associated with each image (see, page 4, line 35 to page 5, line 2 of the specification).

Claim 38 has been amended to introduce subject matter presented in claim 42 and claim 42 has been cancelled without prejudice. A further feature introduced into claim 38 from claim 42 is the step of displaying to a user a user-selected image of the subject organ or part thereof. As described on page 4, lines 19 to 26 of the description, the images of, for example, the left ventricle of a subject could be acquired from an MRI scanner, ultra fast CT, 3-dimensional ultrasound machine or echocardiography, or other suitable imaging modality. Figure 3 shows the guide points editor of the invention in

which the editor window includes panel 20 which, in a preferred form, displays thumb nail images of the images stored in the memory. The user selects an image to be displayed by, for example, clicking on one of the thumb nails displayed in panel 20. The guide points editor could include panel 22 in which the user-selected image of the subject organ or part thereof is displayed in an enlarged form.

Claim 38 also claims (based on claim 42) the step of displaying to the user a representation of the initial fit of the reference model by superimposing on the user-selected image a representation of the intersection of the reference model with the plane of the user-selected image. The reference model could comprise a mathematically defined reference model, such as an ellipsoid having a reference line as a central axis and one or more surface points, each surface point specified by a radial distance from the central axis. The spatial position of at least one of the images has already been defined, as defined in claim 38. The spatial position could be obtained from the image header as described on page 4, line 35 to page 5, line 2 of the specification.

Figure 7 illustrates one example of superimposing on the user-selected image a representation of the intersection of the reference model with the plane of the user-selected image. In Figure 7, the user has selected an image to be displayed in panel 22. A representation of the intersection of the reference model with the plane of the user-selected image is shown by contour line 39A and contour line 39B. Assuming that the spatial position of the image shown in display panel 22 is known, a representation of the intersection of the reference model with the plane of the user-selected image can be obtained from the reference model. This intersection of the reference model is

displayed or superimposed onto the user-selected image shown in the display 22. The step of displaying the user-selected image with a representation of the reference model superimposed onto the image is particularly important as it allows subsequent manual user definition of one or more reference guide points as defined in claim 38 and as described with reference to Figure 8 and so on in the description.

Sheehan describes obtaining images of a patient's heart using an ultrasound transducer. Figure 3 of Sheehan indicates an ultrasound image being a collection of pixels having differing gray scale values based on the relative intensities of each point or pixel in the ultrasound image. These images are described as not being clean lines but instead are somewhat indefinite areas with differing gray scale values. Sheehan states that it is difficult to manually determine the areas of the epicardial and endocardial surfaces in such images (column 10, lines 48 to 56).

Figure 3 of Sheehan is a schematically depicted image that does not show gray scale data that can actually be seen in an ultrasound image. Therefore, the Sheehan image shown in Figure 3 is not the image presented to a user but is instead a schematically depicted image for better description of the Sheehan invention in the patent.

Similarly, Figure 6 of Sheehan illustrates some of the planes for a heart that may be imaged using the ultrasound imaging sensor (column 11, lines 22 to 23). These images are not images that are presented to a user of the Sheehan system.

Figure 12 of Sheehan shows a schematic 220 of the ultrasound mesh model and an intersection of the mesh model with an imaging plane 222. The mesh model produces a gray scale image 226 that predicts the appearance of the ultrasound image

in plane 222. The mesh model is described as producing predicted images corresponding to the images of the patient's heart made in specific imaging planes.

However, imaging plane 222 as described in Sheehan is not equivalent to a user-selected image as defined in claim 38. It is a particularly important feature of the present invention that a representation of the intersection of the reference model is **superimposed** onto the actual user-selected image to facilitate subsequent editing and sophisticated refinement of the model and to improve fit of the model.

The Sheehan patent uses a model to calculate predicted images which contain gray scale values. These are then compared with each other to determine how well they match before trying to improve the model. The mesh model produces a gray scale image 226 that predicts the appearance of the ultrasound image in plane 222. In this manner, the mesh model is used to produce predicted images corresponding to the images of the patient's heart made in specific imaging planes (column 14, line 64 to column 15, line 2). Predicted images are produced from the mesh model (column 6, line 2). The mesh model is used to predict the appearance of the gray scale image in each plane of the images made of the patient's heart. The predicted and observed images are then compared, as indicated in a block 234 (column 15, lines 20 to 24). The ultrasound mesh model estimates an ideal gray scale appearance (i.e. a mean image) and an expected deviation (i.e. the covariance) from the ideal of any image in the patient's imaging data (column 14, lines 56 to 60).

The Sheehan model is used to make synthetic or predicted images and this is a central part of the Sheehan algorithm. By contrast, the present invention as defined in independent claims 38 and 50 displays to a user an actual user-selected image of the

subject organ. A representation of the initial fit of the reference model is also displayed to the user to obtain user feedback and interaction. There is no attempt in the present invention to create images from the model.

The boundaries of the actual image in Sheehan are described as being difficult to determine, as they comprise some definite areas with differing gray scale values (column 10, lines 49 to 56). Therefore, Sheehan teaches away from the step of displaying to a user an image of a selected organ and allowing the user to modify the features of a reference model superimposed on that image.

Based on the above, it is clear that Sheehan does not anticipate the presently claimed invention. Reconsideration and withdrawal of the outstanding anticipation rejection are accordingly respectfully requested.

Favorable action on this application is awaited.

Respectfully submitted,

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